

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A process for the separation of cobalt and/or manganese from impurity elements selected from one or more of calcium and magnesium contained in a leach solution, or for separating cobalt from manganese contained in a leach solution, the process comprising the step of subjecting the leach solution to solvent extraction using an organic solution of a carboxylic acid and an aliphatic hydroxyoxime.
2. The process of claim 1, wherein cobalt poisoning as a result of oxidation of cobalt(II) to cobalt(III) is avoided.
3. The process of claim 1 or claim 2, wherein the solvent extraction of the leach solution with the organic solution produces an organic phase and an aqueous raffinate, and wherein all of the organic phase is subjected to stripping with an acid solution to strip cobalt from the organic phase.
4. The process of claim 3, wherein the stripping with the acid solution is preceded by scrubbing of the organic phase.
5. The process of claim 3 or claim 4, wherein the stripping with the acid solution is preceded by a selective stripping stage.
6. The process of any one of claims 1 to 5, wherein the organic solution displays fast extraction kinetics for copper, cobalt, zinc and manganese.
7. The process of any one of claims 1 to 6, wherein the organic solution is in contact with the leach solution for a period of 5 minutes or less.

8. The process of claim 7, wherein the organic solution is in contact with the leach solution for a period of 3 minutes or less.
- 5 9. The process of claim 7, wherein the organic solution is in contact with the leach solution for a period of 2 minutes or less.
- 10 10. The process of any one of claims 1 to 8, wherein the organic solution comprises a stabilizer against hydroxyoxime degradation.
- 15 11. The process of claim 10, wherein the stabilizer reduces oxidation and/or hydrolysis of the hydroxyoxime.
12. The process of claim 10, wherein the stabilizer is an antioxidant.
- 20 13. The process of claim 10, wherein the stabilizer is an alkylphenol.
14. The process of any one of claims 1 to 13, wherein the leach solution contains little nickel.
- 25 15. The process of any one of claims 1 to 14, wherein the leach solution contains cobalt and/or manganese, together with impurity elements selected from one or more of calcium, magnesium, (manganese) and chloride, optionally together with copper and/or zinc.
- 30 16. The process of any one of claims 1 to 15 wherein, the leach solution contains the following levels of elements:
- Ni: 0 - 100 ppm
- 35 Co: 100 ppm - 5 g/L
- Cu: 0 - 100 ppm
- Zn: 0.2 - 2 g/L

Ca: 1ppm - saturated

Mn: 0.2 - 50 g/L

Mg: 1ppm - 100 g/L

5 17. The process of any one of claims 1 to 16, wherein the
leach solution is a solution that has been subjected to a
preliminary iron and/or aluminium precipitation step to
precipitate out iron and/or aluminium to leave an aqueous
leach solution containing the target elements and impurity
10 elements.

18. The process of any one of claims 1 to 17, wherein the
carboxylic acid is 2-methyl, 2-ethyl heptanoic acid or a
cationic exchange extractant having extraction
15 characteristics similar to 2-methyl, 2-ethyl heptanoic
acid.

19. The process of any one of claims 1 to 18, wherein the
hydroxyoxime is a chelating α -hydroxyoxime.
20

20. The process of any one of claims 1 to 19, wherein the
leach solution contains cobalt and manganese, and the pH
of the aqueous phase in the solvent extraction step is
maintained in the range of from 5.5 to 7.0 to effect
25 extraction of the cobalt and manganese into the organic
phase.

21. The process of claim 20, wherein the pH of the
aqueous phase in the solvent extraction step is maintained
30 in the range of from 5.8 to 6.3.

22. The process of claim 20 or claim 21, wherein the
organic phase containing cobalt and manganese is subjected
to selective stripping to separate to a significant extent
35 the cobalt from the manganese.

23. The process of claim 22, wherein the selective stripping comprises contacting the organic phase from the solvent extraction with an acidic aqueous solution to yield (a) a loaded strip liquor containing manganese and
5 (b) a selectively stripped organic solution containing cobalt.

24. The process of claim 23, wherein the acidic aqueous solution used in the selective stripping has a pH in the
10 range of 4.0 to 5.0.

25. The process of any one of claims 1 to 19, wherein the leach solution contains cobalt and manganese, and the pH of the aqueous phase in the solvent extraction step is
15 maintained in the range of from 3.5 to 5.0 to effect extraction of cobalt into the organic phase and rejection of manganese to the aqueous phase.

26. The process of claim 23, wherein the cobalt is
20 recovered from the organic phase by bulk stripping.

27. The process of any one of claims 1 to 26, wherein the leach solution comprises zinc and/or copper, the zinc and/or copper are extracted into the organic phase with
25 the cobalt in the solvent extraction step, and the zinc and/or copper are separated from the cobalt by ion exchange.

28. The process of any one of claims 1 to 19, wherein the
30 leach solution comprises manganese and a low level or no cobalt, and the manganese is extracted into the organic phase to effect separation of manganese from the impurity elements calcium and/or magnesium.

35 29. The process of any one of claims 1 to 28, wherein scrubbing is conducted on the organic phase after each solvent extraction.

30. A process for the separation of zinc, copper and cobalt from impurity elements selected from one or more of manganese, calcium and magnesium contained in a leach solution, the process comprising the step of subjecting the leach solution to solvent extraction using an organic solution of a carboxylic acid and an aliphatic hydroxyoxime.
31. The process of claim 30, wherein cobalt poisoning as a result of oxidation of cobalt(II) to cobalt(III) is avoided.
32. The process of claim 30 or claim 31, wherein the solvent extraction of the leach solution with the organic solution produces an organic phase and an aqueous raffinate, and wherein all of the organic phase is subjected to stripping with an acid solution to strip cobalt from the organic solution.
33. The process of any one of claims 30 to 31, wherein the organic solution displays fast extraction kinetics for copper, cobalt, zinc and manganese.
34. A product recovered by the process according to any one of claims 1 to 33.